7 **(a)** The following table shows part of the instruction set for a processor. The processor has one register: the Accumulator (ACC).

Instruction		Explanation
Opcode	**Operand**	
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC
LDM	#n	Immediate addressing. Load the number n to ACC
STO	<address>	Store the contents of ACC at the given address
ADD	#n/Bn/&n	Add the number n to the ACC
ADD	<address>	Add the contents of the given address to the ACC
INC	<register>	Add 1 to the contents of the register (ACC)
CMP	<address>	Compare the contents of ACC with the contents of <address>
CMP	#n	Compare the contents of ACC with number n
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True
JMP	<address>	Jump to the given address
END		Return control to the operating system

ACC denotes Accumulator
<address> can be an absolute or a symbolic address
# denotes a denary number, e.g. #123
B denotes a binary number, e.g. B01001010
& denotes a hexadecimal number, e.g. &4A

The current contents of memory are:

Address	Instruction
10	12
11	11
12	10
13	22
14	22
...	
100	LDD 10
101	ADD 12
102	STO 11
103	CMP 14
104	JPE 107
105	INC ACC
106	JMP 101
107	STO 10
108	END

(i) Trace the program currently in memory using the following trace table.

Instruction address	ACC	Memory address				
		10	**11**	**12**	**13**	**14**
		12	11	10	22	22

[3]

(ii) State the effect of changing instruction LDD 10 in address 100 to LDM #10

.....

.....

..... [1]

(iii) Identify **and** describe **one** mode of addressing **not** given in the table of instructions in part **(a)**.

Mode of addressing .....

Description .....

.....

.....
[2]

(b) The table shows part of the instruction set for a processor. The processor has one register: the Accumulator (ACC).

Instruction		Explanation
Opcode	**Operand**	
AND	#n/Bn/&n	Bitwise AND operation of the contents of ACC with the operand
AND	<address>	Bitwise AND operation of the contents of ACC with the contents of <address>
XOR	#n/Bn/&n	Bitwise XOR operation of the contents of ACC with the operand
XOR	<address>	Bitwise XOR operation of the contents of ACC with the contents of <address>
OR	#n/Bn/&n	Bitwise OR operation of the contents of ACC with the operand
OR	<address>	Bitwise OR operation of the contents of ACC with the contents of <address>

<address> can be an absolute or symbolic address
# denotes a denary number, e.g. #123
B denotes a binary number, e.g. B01001010
& denotes a hexadecimal number, e.g. &4A

(i) The ACC currently contains the following binary value.

1	1	1	1	0	0	0	0

Write the result after the instruction OR B00001111 is run.

[1]

(ii) The ACC currently contains the following binary value.

0	0	0	1	1	1	0	1

Write the result after the instruction XOR #30 is run.

[1]